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Curriculum Materials in High-School Mathematics

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Contents

Foreword

AS A PART of a National Survey of Secondary Education in 1932, the Office of Education issued the bulletin, "Instruction in Mathematics," which contains an analysis of courses of study for mathematics. Since that date, the enrollments in the public secondary schools have increased approximately 40 percent and immediate acceleration in the present rate of increase is indicated. The enrollments in mathematics have not kept pace with the total enrollments in secondary schools.

Our Nation needs a mathematics program that will develop the mathematical talents of each child. All pupils need effective instruction in the basic mathematical concepts and at the same time talented pupils should be encouraged to specialize intensively in mathematics and its related fields. The welfare, not only of the pupil but our Nation, may depend upon the success with which we accomplish this difficult educational mission.

The Office of Education is grateful to the curriculum directors and principals who supplied the curriculum material and data on which this study is based. It is hoped that this bulletin will help the many teachers who are attacking the worthy task of improving the mathematical experiences of each child.

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Overview

IN THIS study 135 courses of study or curriculum guides in mathematics are analyzed and a comparison is made with a similar analysis in 1932. The general nature of the study, such as, geographic distribution of the guides, method of binding and publishing, dates of publication, and number of pages, is given in the "Introduction."

There has been little change in the physical characteristics of the curriculum guides over the years, with the exception of an increase in the number of small guides. There is a tendency to develop guides for individual courses in mathematics rather than one guide for all secondary school mathematics. This procedure reflects the philosophy of curriculum development as a continuous process with the mathematics teachers developing and revising some phase of the curriculum each year. For example, during one year the emphasis may be the general mathematics program and the following year it may be the revision of the algebra guide. It is not a single large project which can be quickly completed and then allowed to remain in a static condition.

Following the "Introduction" is a general description of the contents of the local curriculum guides (p. 5). The guides vary greatly in each category whether they are for junior high schools, senior high schools, 6-year high schools, or 4-year high schools. Of the six major areas, only content and objectives were common to all the local curriculum guides. At least one or more guides contained nothing on procedures, tests, individual differences, or references. Even though content and objectives were in all the local guides, the presentation varied from a bare list to a detailed description in lengthy paragraphs. In general, the recent guides contained informal discussions and detailed organized outlines for teaching mathematics rather than the bare list of recommendations so frequently found in the guides in 1932.

A detailed analysis of the local curriculum guides (p. 10) shows that during the past 20 years there has been an increase in the percentage of guides that contain the following material: broad aims in mathematics that are related to the general objectives of secondary education; a psychological and unit organization of the subject matter; an emphasis on the relationship of the content to the detailed aims; content related to the child's needs; visual aids; suggestions for testing attitudes and appreciations; and provisions for revising the guide.

Few of the local guides give attention to the following topics: adapting the objectives and content to local conditions; relationship of specific content to the general aims of education; use of community resources; correlation of the various courses in mathematics; remedial instruction; and provisions for individual differences in pupils. This is in spite of

the fact that much has been written on these topics in professional journals.

A general description of the State curriculum guides begins on page 15. The State curriculum guides gave more space to procedures and content than the local guides and less emphasis to tests and individual differences. Especially was this true for the senior high school guides. A detailed analysis of the State curriculum guides (p. 20) shows an increased emphasis on objectives during the last 20 years, especially in attempts to relate objectives of mathematics to objectives of secondary education. There was a gain during this period in the number of State guides that related methods to the basic textual material and that contained corrective and practice material and references to additional subject matter. The recent guides contained less evidence of authoritative procedures and seldom did they provide definite suggestions for adapting the curriculum to the local community.

From 1932 to 1952 there was little gain in the number of State curriculum guides that included specific materials for individual differences, for ability groups, or for the laboratory plan. Also there was little change in the percentage of State guides that provided information on visual aids for teaching of mathematics, pupil use of study material, and provisions for the rapid learner. The current guides placed less emphasis on some topics than the guides in 1932. For example, suggestions for evaluating mathematical outcomes, illustrative and type lessons, and references to teaching were in fewer current guides than in the guides of 1932.

In general, State guides no longer contain standards for classification and promotion. No doubt this reflects the philosophy of placing the responsibility for standards upon the local school system. Although required standards may hinder teacher experimentation, suggested standards of attainment may promote higher levels of achievement and give inexperienced teachers a feeling of security.

Various approaches to curriculum development are found in both the local and State guides. Some of these curriculum practices with their advantages and disadvantages are presented under "Methods of Developing Curriculum Material" (p. 24). Many of the most promising practices also have been compiled in a checklist on page 29.

Introduction

DURING the last 30 years the hours of labor have been shortened for persons in many professions but not for the teacher. All innovations, be they guidance or methods of reporting pupil progress to parents, seem to take a few more minutes of the busy teacher's time. The preparation of curriculum materials has been no exception.

Two factors make the development of curriculum guides more time-consuming than 3 decades ago. First, the procedures for developing these guides have changed markedly. The curriculum guide in mathematics is no longer prepared for the teachers by a small group of specialists. The teachers take an active part in planning and writing the present courses of study or curriculum guides. No doubt this procedure is desirable, but it requires much effort on the part of the teachers. Is it fair to ask teachers to develop curriculum materials without providing them with the time or aid for the task?

The second factor that has increased the burden of curriculum development is the conception of curriculum revision as a continuous process. During times of change, the curriculum of the secondary school should not be static. It should not only reflect the society of which it is a part, but it should point the way for improvements. Curriculum guides in mathematics need continuous revision. New applications are constantly being found for elementary mathematics principles. New concepts of child growth and development are discovered. In view of these broader concepts and responsibilities, teachers are inclined to feel that they have an insurmountable task when at the first faculty meeting of the year the principal says "This year we shall develop curriculum guides for each of the subjects."

The purpose of this study is to help persons who are faced with the task of improving or developing curriculum materials in mathematics and also those persons who frequently rethink the objectives for the teaching of mathematics.

PREVIOUS REPORTS AND STUDIES

Surveys of courses of study were made by the Office of Education in the following years: (1) 1924; (2) 1930; (3) 1931; (4) 1933; (5) 1935; and (6) 1937.

The first four surveys were mere lists of courses of study, the fifth was an annotated list. The sixth survey,[1] which was made in 1937, included an analysis of the courses of study for many subjects in grades kindergarten to twelfth. Mathematics was represented with 130 pieces of curriculum material distributed in grades 1–12.

[1] Leary, Bernice E., A Survey of Courses of Study and other Curriculum Materials Published Since 1934, Washington, U. S. Government Printing Office, 1937. Office of Education, Bulletin 1937, No. 31.

In 1933 a National Survey of Secondary Education was made by the Office of Education. In connection with this National Survey, Edwin S. Lide [2] made an analysis of 119 courses of study in mathematics.

GENERAL NATURE OF THE REPORT

This report includes an analysis of 135 courses of study or curriculum guides in mathematics. The sources of these courses of study are described below.

The curriculum material was analyzed in terms of geographic distribution, style of publication, size, date of publication, and manner of treating and space devoted to major phases, such as objectives, individual differences, teaching procedures, and evaluation. In order to observe trends more easily, much of the data have been compiled in the same type of tables as those of previous studies [3] of curriculum development.

DISTRIBUTION AND GENERAL NATURE OF CURRICULUM GUIDES

The courses of study or curriculum guides in mathematics used in this study represent every geographic region in the United States. The number of guides from the various regions were as follows: New England, 4; Middle Atlantic, 28; East North Central, 12; West North Central, 23; South Atlantic, 28; East South Central, 1; West South Central, 19; Mountain, 4; and Pacific, 15. Twenty-eight courses of study or curriculum guides were developed by State agencies and 107 by local schools.

While the list of materials used in this study is not exhaustive, an attempt was made to secure all available current courses of study or curriculum guides in secondary school mathematics. The methods used were:

(1) Writing directly to all the State departments of education.

(2) Canvassing the curriculum material on file at the libraries at Teachers College, Columbia University, New York University, and the United States Department of Health, Education, and Welfare. The courses of study or curriculum guides located in these libraries were included in this study only if they were currently in use.

(3) Writing directly to schools which were suggested by (*a*) State departments of education, (*b*) leaders in mathematics education, and (*c*) results of a questionnaire from a random sampling of 965 public high schools.

From these sources the 135 currently used courses of study or curriculum guides in mathematics were secured.

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[2] Lide, Edwin S., Instruction in Mathematics. National Survey of Secondary Education. Washington, U. S. Government Printing Office, 1933. (Office of Education, Bulletin 1932, No. 17, Monograph 23.)

[3] Lide, Edwin S., Instruction in Mathematics. National Survey of Secondary Education. Washington, U. S. Government Printing Office, 1933. (Office of Education, Bulletin 1932, No. 17, Monograph 23.) Harap, Henry, A Critique of Public School Courses of Study 1928-29. *Journal of Educational Research*, 21: 109–119, February 1930.

Although two of the publications were dated prior to 1932, most of the guides were developed recently (see table 1) and all were reported as being in current use. Since 93 of the publications were produced during the last 4 years, one could conclude that most of the currently used curriculum guides in mathematics were of recent origin.

Table 1.—Date of publication of courses of study or curriculum guides

Date	Number of curriculum guides		Date	Number of curriculum guides	
	State (28)	Local (107)		State (28)	Local (107)
1926	1		1945	1	5
1930		1	1946	4	6
1934	1		1947	2	5
1936	1		1948		5
1938		1	1949	7	12
1939	1	2	1950	6	14
1942	1		1951	1	11
1943	1	3	1952	1	35
1944		1			

PHYSICAL CHARACTERISTICS OF THE CURRICULUM GUIDES

The majority of the courses of study or curriculum guides were in mimeographed form. Of those developed by cities or local schools, 70 percent were mimeographed or multilithed, 22 percent were printed, and 8 percent were typed. The proportion of printed material was much greater in the case of State curriculum guides. Of the 28 State guides, 20 were printed. The greater amount of local mimeographed material may imply that cities revise curriculum guides more frequently than do State systems; however, it probably merely reflects the economy in mimeographing when the number of copies is small. The manner of publishing curriculum material in mathematics has changed little during the last 20 years. (See table 2.)

Table 2.—Manner of publishing curriculum guides: 1932, 1937, and 1952

Method	Percent of curriculum guides		
	1932 [1]	1937 [2]	1952
Mimeographed	68	74	70
Printed	27	22	22
Typed	5	4	8

[1] Lide, Edwin S., Instruction in Mathematics. National Survey of Secondary Education, Washington, U. S. Government Printing Office, 1933, p. 2. (Office of Education, Bulletin 1932, No. 17, Monograph 23.)
[2] Leary, Bernice E., A Survey of Courses of Study and other Curriculum Materials Published Since 1934. Washington, U. S. Government Printing Office, 1938, p. 9. (Office of Education, Bulletin 1937, No. 21.)

The preferred binding, among the local curriculum guides, was stapled pages. (See table 3.) Much of the material that was stapled had been punched for looseleaf binders which makes the guide easier to revise.

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Table 3.—Distribution of curriculum guides, by style of publication and by number of pages

Style of publication	Number of pages [1]				
	1–10	11–50	51–100	101 or more	Total
1	2	3	4	5	6
State Guides (28):					
Printed and bound	1	5	6	7	19
Mimeographed and bound	0	0	0	0	0
Printed and looseleaf	0	1	0	0	1
Mimeographed and stapled	0	8	0	0	8
Typed and stapled	0	0	0	0	0
Local Guides (107):					
Printed and bound	0	2	4	3	9
Mimeographed and bound	0	5	2	5	12
Printed and looseleaf	1	15	6	2	24
Mimeographed and stapled	25	22	4	0	51
Typed and stapled	11	0	0	0	11

[1] Number of pages devoted to mathematics when part of a general or combined curriculum guide.

In 1952 curriculum guides of fewer than 10 pages were more common than in 1932. (See table 4.) This seems to be due to the increased number of publications confined to one course, such as general mathematics or elementary algebra. With this exception, there seems to have been little change in the size of the curriculum guides during the past 20 years.

Table 4.—Number of pages in local curriculum guides in mathematics: 1932 and 1952

Year	Number of pages				
	Fewer than 10	10–50	50–100	More than 100	Total
1	2	3	4	5	6
1932 [1]	20	55	18	10	103
1952	37	44	16	10	107

[1] Lide, Edwin S., Instruction in Mathematics. National Survey of Secondary Education, Washington, U. S. Government Printing Office, 1933. (Office of Education, Bulletin 1932, No. 17, Monograph 23.)

A majority of the mimeographed guides were on pages 8 inches wide and 11 inches long; however, the size of pages in printed bulletins varied from a leaflet to large sheets of paper with multiple foldings. Although the size of the page should be that which is most convenient for the user, greater uniformity in size of page would facilitate filing of curriculum materials.

General Characteristics of Local Curriculum Guides

THE LOCAL teaching guides varied greatly. Some extremely brief guides contained mere lists of objectives and content topics with no suggestions for providing for individual differences, using the community resources or evaluating the growth of the pupils toward the indicated educational goals. Other extremely complete guides contained lengthy discussions of philosophy, objectives, and content materials. There were samples of teaching units, resource units, and tests. Methods of presenting material were given in detail. Example problems were completely solved and explained. There were both a minimum set of concepts and an optional list for the talented pupil.

The content of the guides varied from a single half-year course in mathematics to a compilation of all subjects taught in grades kindergarten to twelfth. Several schools issued a separate bulletin for each course in mathematics. The small separate publications were a result of confining curriculum development to a single subject for 1 year. Thus after several years the entire area of mathematics might receive the emphasis of curriculum revision.

Although the curriculum guides differed markedly in content, number of pages, size of pages, and method of preparation, most guides were alike in devoting attention to objectives and subject matter to be taught. Some guides were written by specialists, but the majority were developed by groups of teachers.

MAJOR PHASES (AREAS) TREATED IN LOCAL JUNIOR AND JUNIOR-SENIOR HIGH SCHOOL CURRICULUM GUIDES

The manner of treating seven phases of the local junior high school and junior-senior high school curriculum guides in 1952 as compared with the same phases in guides of 1932 is shown in table 5.

All curriculum guides in 1952 considered objectives, while 16 percent of the guides in 1932 did not treat them. The method of treating objectives has changed from a bare list or parallel columns to either an organized outline, an organized paragraph, or an informal account.

In the 1952 curriculum guides, the most common method of presenting both procedures and content was through an organized outline. This method was used in 60 percent of the guides for presenting the procedures and in 48 percent of the guides for the content. In 1932 the percentages were 35 and 9 for the respective phases, procedures, and content. The percentage of guides giving a bare list of content material markedly decreased from 1932 to 1952.

Table 5.—Comparison of manner of treating major phases of junior and junior-senior high school curriculum guides in the surveys of 1932 and 1952

Phase	Informal account				Bare list				Organized outline				Parallel columns				Division into units				Organized paragraph				Not treated				Total	
	1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932	1952
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Objectives	5	9	5	20	32	56	6	24	4	7	9	36	6	10	1	4	0	0	0	0	1	2	4	16	9	16	0	0	57	25
Procedures	16	28	4	16	7	12	0	0	5	9	12	48	10	18	2	8	0	0	0	0	7	12	3	12	12	21	4	16	57	25
Content	5	9	2	8	16	28	1	4	20	35	15	60	10	18	4	16	5	9	2	8	0	0	1	4	1	2	0	0	57	25
Tests	5	9	6	24	10	18	1	4	7	12	5	20	0	0	0	0	1	2	0	0	0	0	1	4	34	59	12	48	57	25
Individual differences	7	12	8	32	2	4	0	0	1	2	0	0	4	7	1	4	0	0	0	0	0	0	1	4	42	73	13	52	57	25
References	0	0	1	4	21	36	14	56	2	4	1	4	2	4	2	8	0	0	0	0	1	2	3	12	32	56	5	20	57	25
Miscellaneous	15	26	8	32	4	7	0	0	1	2	3	12	0	0	0	0	0	0	0	0	0	0	3	12	37	65	11	44	57	25

The table should be read as follows: the objectives were presented by means of an informal account in 5 of the junior or junior-senior high school curriculum guides in 1932. This number is 9 percent of the 57 guides in the 1932 survey.

NOTE.—The horizontal total of the percentages for each phase for 1932 or 1952 is 100.

Tests were treated by only 41 percent of the curriculum guides in 1932 and by 52 percent in 1952. It will be noted from table 5 that the manner of treatment has changed from a bare list to an informal account or organized outline. Individual differences were treated in more of the guides in the survey of 1952 than in 1932. However, less than half of the current guides provided informal suggestions for providing for individual differences.

In 1932 the survey indicated less than half (44 percent) of the guides contained references, while in 1952 the percentage had increased to 80.

MAJOR PHASES (AREAS) TREATED IN LOCAL SENIOR OR 4-YEAR HIGH-SCHOOL GUIDES

In 1952 all local guides for the senior or 4-year high school contained material on objectives and teaching content, while in 1932 nearly one-fourth of the guides omitted objectives entirely. The organized outline was the method used by 40 percent of the guides for presenting objectives and by 61 percent of the guides in presenting the content. In 1932 the objectives, procedures, and content were more frequently presented as a bare list than in 1952. Fifty-nine percent of the guides in the 1932 survey gave a bare list of objectives, while in 1952 the percentage was 31. The percentage of guides presenting the content in this form dropped from 41 percent to 8 percent.

Even in 1952 more than 60 percent of the guides for the senior and 4-year high school neglected to treat either tests or individual differences. When tests were considered in the curriculum guides for mathematics in the local senior or 4-year high school, the procedure was usually a brief informal account or outline. As indicated in table 6, references occurred in more guides in 1952 than in 1932. The references were usually lists of supplementary books of subject matter with an occasional reference to a textbook on the teaching of mathematics.

PERCENTAGE OF SPACE DEVOTED TO MAJOR AREAS

Table 7 shows the percentage of space of the State and local curriculum guides in 1932 and 1952 devoted to 7 phases of instruction in the 7th and 10th grades. It will be observed that between 1932 and 1952 the median percentage of space devoted to objectives has increased, but the range has decreased; thus the variation in the space given to objectives is less in the recent guides. Most guides in this survey considered objectives, but in only a few guides was more than 20 percent of the space devoted to the topic. The percentage of space on procedures in the State and local curriculum guides during the period of these 2 surveys decreased markedly for both 7th and 10th grades. Three-fourths of the average guide in 1932 was on procedures and in 1952 the proportion had dropped to about one-tenth. The amount of space given to content changed little between 1932 and 1952 for the 7th grade, but for the 10th grade it had decreased

Table 6.—Comparison of manner of treating major phases of senior and 4-year high-school curriculum guides in the surveys of 1932 and 1952

Phase	Informal account				Bare list				Organized outline				Parallel columns				Division into units				Organized paragraph				Not treated				Total	
	1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932		1952		1932	1952
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	No.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Objectives	1	4	2	8	13	59	7	31	2	9	9	40	0	0	1	4	0	0	3	13	1	4	1	4	5	24	0	0	22	23
Procedures	7	33	4	18	3	13	1	4	2	9	6	26	0	0	2	8	2	9	4	18	2	9	2	8	6	27	4	18	22	23
Content	1	4	0	0	9	41	2	8	7	33	14	61	1	4	3	13	4	18	4	18	0	0	0	0	0	0	0	0	22	23
Tests	3	13	3	13	1	4	0	0	2	9	3	13	0	0	0	0	0	0	2	8	0	0	0	0	16	74	15	66	22	23
Individual differences	4	18	7	31	0	0	0	0	1	4	0	0	1	4	1	4	0	0	1	4	1	4	0	0	15	70	14	61	22	23
Enforcement	0	0	2	8	8	37	10	44	1	4	4	18	0	0	0	0	0	0	2	8	0	0	1	4	13	59	4	18	22	23
Miscellaneous	7	33	6	26	1	4	0	0	2	9	1	4	0	0	0	0	0	0	1	4	0	0	4	18	12	54	11	48	22	23

The table should be read as follows: the objectives were presented by means of an informal account in 1 of the senior or 4-year high school curriculum guides in 1932. This number is 4 percent of the 22 guides in the 1932 survey.

NOTE.—The horizontal total of the percentages for each phase for 1932 or 1952 is 100.

about 15 percent. The 7th grade placed more emphasis on procedures than the 10th grade, but for content the reverse was true.

The median percentage of space devoted to tests or individual differences was only 1 percent. For the tenth grade one guide devoted 68 percent of space to tests, but many guides did not treat the subject. It will be observed from table 7 that the median percentages devoted to tests, individual differences, and references, although low, have increased since 1932.

Table 7.—Percentage of space devoted to certain major phases of instruction in curriculum guides for mathematics: 1932 and 1952

Phase of instruction	Grade	Percent of space			
		1932		1952	
		Median	Range	Median	Range
1	2	3	4	5	6
Objectives	7	4.5	0–40	13	0–29
	10	13.6	0–60	12	0–40
Procedures	7	26.6	0–90	15	0–50
	10	23.0	0–80	8	0–50
Content	7	36.4	0–100	35	15–100
	10	55.3	0–100	40	14–100
Tests	7	0	0–70	1	0–20
	10	0	0–20	1	0–68
Individual differences	7	0	0–80	1	0–15
	10	0	0–50	1	0–12
References	7	0	0–50	3	0–22
	10	0	0–30	2	0–18
Miscellaneous	7	0	0–30	2	0–10
	10	0	0–40	1	0–8

Specific Characteristics of Content and Form of the Local Curriculum Guides

OBJECTIVES

In this study junior high school curriculum guides for mathematics devoted more space to general objectives of secondary education and to the general objectives for the school than did the senior high school guides. (See table 8–I.) The latter were more apt to contain objectives for specific courses than those of the junior high school.

The broad aims of the subject seem to be more closely related to the major objectives of education in the curriculum guides in 1952 than in 1932. However, the detailed aims were not always related or in harmony with the broad aims. Many curriculum guides devoted several pages to a discussion of general objectives. Justification of these objectives at times was quite verbose but usually in general terms or the quotation of an authority in mathematics education. The methods of implementing these broad aims were brief. If there were a close relationship between the detailed aims of the unit of work in the course and the broad aims set up for mathematics, it was seldom pointed out.

There was little evidence in local curriculum guides of the influence of the local community on the development of the objectives in the teaching of mathematics.

SELECTION AND ORGANIZATION OF MATERIALS

The subject matter recommended by the local curriculum guides was more frequently related to the detailed aims than the broad aims. It will be noticed in table 8 section II that nearly one-half of the curriculum guides in both the junior and senior high schools had material that was related to the detailed aims of mathematics education as stated in the guides. Only about one-fourth of the guides had material that was related to the broad aims.

Table 8, section II, shows that many curriculum guides suggested content material related to future needs of pupils, but the number of guides that related the material directly to the pupils' present needs was much less. Five times as many junior high school guides as senior high school guides in mathematics contained material on pupil needs. Of course, these characteristics, as well as many other characteristics in this table, are not mutually exclusive. Several guides contained material that was related to both the present and future needs of students. Neither the curriculum guides for mathematics in 1932 nor those in 1952 contained a substantial amount of local material. The selection of subject matter seemed to be little influenced by local conditions. In 1952 only 40 per-

cent of the junior high school guides and 15 percent of the senior high school guides contained any suggestions for using the community resources in teaching mathematics.

As shown in table 8, section II, more of the teaching guides in 1952 emphasized a psychological organization of content than the guides in 1932; however, the logical organization is still predominant in the guides for the senior high school.

More than half of the curriculum guides for mathematics organized the material on some unit plan. The emphases in these units, however, were on the topics within the traditional courses in mathematics. Many guides included material from other subject fields, but there was little attempt at correlation. Many curriculum guides contained discussions on individual differences and reteaching but seldom provided specific material. In fact, only 17 percent of the guides for senior high schools included any material for remedial instruction.

Approximately the same percentage of curriculum guides for senior high school contained time allotments for the courses in 1952 as in 1932, but the percentage of junior high school guides that provided a time schedule had decreased. There was little indication that any objective studies were used in determining the selection and organization of the material. Only three guides referred to any type of objective data on which the selection of the subject matter was based or determined.

The content material seemed to be more often related to specific aims in 1952 than in 1932. Although more guides in 1592 than in 1932 attempted to present material related to child needs, much of the senior high school material seemed to be for remote or adult needs. In the objectives, references occasionally were made to remedial teaching, but little material was provided for that specific purpose. In the selection and organization of material, little indication is given that any objective criteria were used.

INDIVIDUAL DIFFERENCES

In the junior high school.—The three items on individual differences found most frequently in the junior high school curriculum guides were: (1) suggestive supplementary activities familiar to the pupil, (2) relationship of activities to mastery of specific objectives, and (3) procedures suggestive for individual progress. However, these items were found in only about one-third of the local curriculum guides. Suggestions on the use of the laboratory plan, directed study, and experimentation were contained in only two of the guides. Seldom were there included specific materials for individual pupils or different ability groups.

In the senior and 4-year high school.—The teaching guides for mathematics in the senior high schools contained material on individual differences even less frequently than the guides for junior high school. In no

case was any item on individual differences found in more than four curriculum guides for the teaching of mathematics in the senior and 4-year high schools. (See table 8, sec. III.)

In 1932 and 1952.—Even though only one item on individual differences was referred to by as many as half the guides in 1932, suggestions for providing for individual differences seemed to be even less frequent in 1952. (See table 8, sec. III.)

TEACHING PROCEDURES

Junior high school.—The majority of the junior high school curriculum guides contained teaching procedures only for certain topics. These topics were usually the newer and the more troublesome topics found in the textbooks. Many references to additional subject matter and aids were included. Illustrative lessons or suggestions for the correlation with other subjects were seldom found.

Senior high school.—More of the senior high school guides than those in the junior high school contained general teaching procedures. In all other items under teaching procedures, the junior high school guides ranked first. (See table 8, sec. IV.)

In 1932–52.—Since the percentage of pages devoted to teaching procedures was less in 1952 than in 1932, one would expect to find the specific items on teaching procedures less frequently in the current guides. Table 8, section IV, shows that in general this is the case.

The four items that were considerably more frequent in the guides in 1952 than in 1932 are (1) procedures connected with the outline of specific material, (2) procedures related to basic textual material, (3) suggestions for visual aids, and (4) references to additional subject matter. (See table 8, sec. IV.)

MEASURING THE LEARNING PRODUCT

Only about one-third of the local curriculum guides for either the junior high school or senior high school contained detailed statements of expected outcomes. This same condition was reported in the survey in 1932. Fewer curriculum guides in 1952 contained general standards for classification and promotion. One-third of the senior high school guides and two-thirds of the junior high school guides contain suggestions for testing skills and knowledges. This condition is similar to that reported in the survey of 1932; however, more guides in 1952 contained suggestions for testing attitudes and appreciations.

MECHANICAL MAKEUP

The mechanical makeup of the local junior high school curriculum guides was in general better than those in the senior high school, and there seemed to have been an improvement in the makeup of all guides since

1932. Some conveniences of reference such as a table of contents, index, or reference tabs were found in half of the junior high school curriculum guides and one-fourth of those in the senior high school. The most marked improvement was the provision for revision found in two-thirds of the junior high school guides and half of the senior high school guides. Some of the guides contained suggestions for revision with blank space provided for additions and changes. Many of the guides were punched for looseleaf binders to facilitate the addition of new material. The greater use of the parallel columns for presenting material in 1932 than in 1952 caused the item, "Mechanical aids to emphasis," to receive a low rating. With this exception, the mechanical makeup has improved over the years with local junior high school curriculum guides still superior to those in the senior high school.

Table 8.—Comparison of the number of local curriculum guides which exhibit certain characteristics in content and form in the surveys of 1932 and 1952

Characteristic	Number and percent of curriculum guides							
	1932				1952			
	Junior high school (57)		Senior high school (46)		Junior high school (25)		Senior high school (25)	
	No.	%	No.	%	No.	%	No.	%
1	2	3	4	5	6	7	8	9
I. Objectives								
1. All secondary education	9	16	6	13	6	24	5	22
2. Junior high school or senior high school	6	11	0	0	3	12	1	4
3. Secondary mathematics	8	14	20	43	7	28	13	52
4. Junior or senior high school mathematics	32	56	7	15	17	68	8	35
5. Grade or course	28	49	42	91	14	56	18	78
6. Specific outcomes for each grade or course	24	42	10	22	9	36	11	48
7. Broad aims related to major objectives	8	14	3	7	9	36	8	35
8. Detailed aims related to broad aims	8	14	0	0	6	24	5	22
9. Influence of authoritative formulations	34	60	31	67	16	64	18	78
10. Influence of local conditions	7	12	1	2	5	20	1	4
II. Selection and organization of materials								
1. Materials specifically related to broad aims	11	19	1	2	6	24	6	26
2. Materials specifically related to detailed aims	28	49	10	22	10	40	11	48
3. Materials specifically related to future life needs	47	82	6	13	21	84	13	57
4. Materials specifically related to children's needs	44	77	3	7	16	64	3	13
5. Selection of local materials	26	46	5	11	10	40	3	13
6. Materials organized psychologically	27	47	7	15	16	64	6	26
7. Materials organized logically	20	35	39	85	9	36	16	70
8. Some materials chosen from other subject fields	52	91	6	13	20	80	10	43
9. Material organized on unit plan (other than textbook)	13	23	7	15	14	56	12	52
10. Relative emphasis on topics within course	33	58	19	41	16	64	18	78
11. Specific materials for reteaching, relearning	24	42	1	2	4	16	2	9
12. Suggestions as to articulation	14	25	6	13	9	36	4	17
13. Time allotments	35	61	25	54	5	20	12	52
14. Indication of use of objective studies	9	16	1	2	2	8	1	4

Table 8.—Comparison of the number of local curriculum guides which exhibit certain characteristics in content and form in the surveys of 1932 and 1952—Continued

Characteristic	Number and percent of curriculum guides							
	1932				1952			
	Junior high school (57)		Senior high school (46)		Junior high school (25)		Senior high school (23)	
	No.	%	No.	%	No.	%	No.	%
1	2	3	4	5	6	7	8	9
III. *Individual differences*								
1. Specific materials selected	19	34	13	28	4	16	3	13
2. Materials for ability groups	9	16	10	22	4	16	4	17
3. Suggestions as to use of laboratory plan	9	16	7	15	2	8	2	9
4. Suggestions as to directed study	6	11	5	11	2	8	2	9
5. Suggestive supplementary activities familiar to pupil	36	62	12	26	8	32	4	17
6. Activities distinct for knowledges, habits, attitudes, etc	14	25	1	2	4	16	3	13
7. Connection of activities to mastery of specific objectives	27	47	8	17	8	32	4	17
8. Procedures suggestive for individual progress	24	42	9	20	8	32	3	13
9. Suggestions as to experimentation	4	7	3	7	1	4	1	4
10. Indication of use of objective studies	10	17	0	0	4	16	1	4
IV. *Teaching procedures*								
1. General procedures applicable to entire course	31	54	34	74	7	28	9	39
2. Procedures connected with outline of specific materials	36	62	22	48	19	76	15	65
3. Illustrative and type lessons	5	9	6	13	5	20	2	9
4. Suggestions as to topics of local interest	38	67	10	22	8	32	5	22
5. Suggestions as to correlation with other subjects	9	16	7	15	3	12	2	9
6. Related to basic textual materials	29	51	22	48	16	64	15	65
7. Attention to attractive style of writing	7	12	3	7	4	16	3	13
8. Suggestions as to pupil use of study materials	18	32	8	17	7	28	5	22
9. Suggestions as to visual aids	12	21	8	17	10	40	7	30
10. Suggestions as to corrective and practice materials	30	53	9	20	8	32	4	17
11. References to additional subject matter	28	49	20	43	17	68	12	52
12. References to methods and theory of teaching	26	46	18	39	8	32	3	13
V. *Measuring the learning product*								
1. General standards for classification and promotion	18	32	5	11	2	8	2	9
2. Detailed statement of expected outcomes of learning	19	34	9	20	8	32	7	30
3. Suggestions for testing knowledges and skills	35	61	13	28	16	64	8	35
4. Suggestions for testing attitudes and appreciations	7	12	0	0	6	24	4	17
5. Use of objective studies in determining standards	6	11	0	0	1	4	0	0
VI. *Mechanical makeup*								
1. Attention to convenience of reference	22	39	8	17	12	48	6	26
2. Provision for teacher revision	6	11	3	7	16	64	11	48
3. Mechanical aids to emphasis	15	26	3	7	3	12	2	9

The table should be read as follows: (last item) Mechanical aids to using the guide were contained in 15 junior high school guides. This number is 26 percent of the total (57) junior high school guides.

NOTE.—Since these are independent items, the total of the percentages either vertically or horizontally should not necessarily be 100.

Characteristics of State Curriculum Guides

TREATMENT OF MAJOR PHASES OF STATE CURRICULUM GUIDES

All except two of the State curriculum guides contained objectives for teaching mathematics. The usual procedure was to present the objectives in a list or organized outline. (See table 9.) The junior high school was more likely to depart from this pattern by giving an informal account or using an organized paragraph than the other types of schools. In presenting the procedures, the junior high school guides frequently used organized paragraphs or gave an informal account, while the senior high school guides gave a more formal presentation through an organized outline or parallel columns and in three cases they omitted procedures entirely.

The content for both the junior high school and senior high school was presented in organized outlines or parallel columns. In only two cases was content described informally, and these guides were for the junior high school. Tests were treated in less than half of the guides. When tests were considered, it was usually by means of an informal account or a bare list.

Less than half of the guides contained material on individual differences. In these cases it was an informal discussion in general terms.

References were usually included in the State guides. In some cases lengthy bibliographies of additional content material, methods, and teaching aids were provided. Miscellaneous material, such as how the guide was developed, how it could be revised, and theories of curriculum development, was usually given in an informal account.

SPACE DEVOTED TO CERTAIN AREAS OF CURRICULUM DEVELOPMENT

An indication of the wide variation in guides is the range in percentage of space devoted to seven phases of curriculum development.

Table 10 shows that at least 1 State guide and 1 local guide devoted the entire space to subject matter. Other guides gave little or no space to content. About a third of the average guide for the 7th grade was content and the proportion in the 10th grade was slightly greater.

Some State curriculum guides placed considerable emphasis on procedures; in fact, 80 percent of the space in one guide was on procedures. Other guides devoted no space to this phase. The median percentage of space on procedures varied from 8 percent for the 10th-grade local guides to 30 percent for the 10-grade State guides.

There was a great variation among the guides in the space they gave to objectives. One State guide for the 10th grade gave 80 percent of the

Table 9.—Comparison of the manner of treating major phases of junior or junior-senior high school curriculum guides and the senior or 4-year high-school curriculum guides

Phase	Informal account		Bare list		Organized outline		Parallel columns		Division into units		Organized paragraph		Not treated		Total	
	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Objectives	3	0	3	5	4	4	0	0	1	0	1	0	1	1	13	10
Procedures	3	2	0	0	2	2	2	2	1	1	5	0	0	3	13	10
Content	2	0	0	1	7	5	3	2	0	1	0	0	1	0	13	10
Tests	4	1	0	2	0	0	0	0	0	0	1	0	8	7	13	10
Individual differences	3	2	0	0	0	0	0	0	0	0	2	0	8	8	13	10
References	0	0	7	5	1	3	2	1	1	0	0	0	2	1	13	10
Miscellaneous	2	1	1	0	0	1	0	0	0	0	4	1	6	7	13	10

The table should be read as follows: the objectives were presented by means of an informal account in 3 of the junior or junior-senior high school curriculum guides. None of the senior or 4-year high-school guides presented the objectives in an informal account.

space to objectives and other guides did not consider the objectives for either the 7th or 10th grade. About one-tenth of the average guide for both the 7th and 10th grades was on objectives.

In one 10th-grade guide 68 percent of the space contained material on tests and in several other 7th- and 10th-grade guides tests were not mentioned. The median percentage for both the junior high school and senior high school guides was about 1 percent, which denotes little space given to methods of providing for individual differences in pupils in mathematics.

References required 22 percent of the space in one seventh-grade guide, while no space was given to the topic in other guides. The median percentage for both the 7th- and 10th-grade guides was slightly less than 5. Usually the local teaching guides devoted more space to objectives than the State guides. The median percentage for the local guides was about three more than that of the State guides. However, the space given to procedures in the State guides far exceeded that of the local guides. For example, the median percentage for the 10th-grade local guides was 8 and for the State guides it was 30.

The State curriculum guides usually gave more space to both procedures and content than the local guides while the local guides exceeded the State guides in space devoted to tests, individual differences, and miscellaneous material. Perhaps it should be noted from table 10 that none of these major areas of the curriculum are discussed by every State guide and only one area, content, was considered by all local curriculum guides. This wide variation in individual curriculum guides was observed in style of presentation, philosophical discussions, and material presented as well as amount of space given to these major topics.

Table 10.—Comparison of space devoted to certain phases of instruction in State and local curriculum guides

Phase of instruction	Grade	Percent of space			
		State guides		Local guides	
		Median	Range	Median	Range
1	2	3	4	5	6
Objectives	7	10	0–30	13	0–29
	10	10	0–30	12	0–40
Procedures	7	30	0–77	15	0–50
	10	30	0–30	8	0–50
Content	7	60	0–100	35	15–100
	10	50	0–100	40	14–100
Tests	7	0	0–10	1	0–30
	10	0	0–30	1	0–60
Individual differences	7	0	0–10	1	0–15
	10	0	0–6	1	0–12
References	7	0	0–15	3	0–22
	10	5	0–17	2	0–18
Miscellaneous	7	1	0–10	2	0–10
	10	0	0–10	1	0–8

Table 11.—Comparison of the percentage of 23 State and 48 local curriculum guides, which treated certain major areas

Phase	Informal account		Base list		Organized outline		Parallel columns		Division into units		Organized paragraph		Not treated	
	State	Local	State	Local	State	Local	State	Local	State	Local	State	Local	State	Local
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Objectives	13	15	35	27	35	37	0	4	9	6	4	10	9	0
Procedures	22	17	0	2	18	37	18	8	9	8	22	10	13	17
Content	8	4	4	6	56	60	22	14	0	12	0	2	4	0
Tests	22	19	8	2	0	16	0	0	0	4	4	2	66	56
Individual differences	22	31	0	0	0	0	0	4	0	2	9	6	70	56
References	0	6	52	50	13	10	13	4	4	8	0	2	13	19
Miscellaneous	13	29	4	0	4	8	0	0	0	2	22	15	56	46

The table should be read as follows: an informal account was given of the objectives by 13 percent of the 23 State curriculum guides and 15 percent of the 48 local guides.

COMPARISON OF STATE AND LOCAL CURRICULUM GUIDES, BY MAJOR PHASES

There was little difference in the treatment of the objectives of instruction by the State or local school guides. There was a slight tendency for the local guides to present the objectives in an informal account or organized paragraph, while the State guides used a bare list. (See table 11.)

In presenting procedures, the local guides more frequently used the organized outline and the State guides used an organized paragraph. In other respects there was little difference in the manner of treating the procedures. Likewise, there was little difference in the treatment of the content. The majority of both used an organized outline.

When evaluation material was included in the guides, it was usually an informal account in both the State and local guides. The same was true for ways for providing for individual differences. References were usually mere lists or outlines in both the State and local guides. As it will be observed in table 11 there was more variation in the treatment of the major topics between individual guides than between the guides produced by State groups and those by local groups.

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Comparison of State Curriculum Guides in 1932-1952

OBJECTIVES

In comparing the objectives found in the State curriculum guides in the two surveys, the following areas seemed to receive more emphasis in 1952: the objectives for all secondary education, objectives for all secondary mathematics as well as the specific grade or course, and the broad aims of the subject related to the major objectives of education.

More guides in 1952 than in 1932 made an attempt to show the relationship of the detailed aims of a specific topic to the general objectives of secondary education; however, even in 1952 many guides failed to show this relationship if it existed. In the recent survey there was less evidence of authoritative formulations than in the study of 1932, but there was little in either survey that indicated the influence of local conditions in the objectives proposed for the teaching of mathematics. (See table 12.)

SELECTION AND ORGANIZATION OF MATERIALS

More curriculum guides in 1952 than in 1932 contained teaching material as well as objectives specifically related to both broad aims and detailed aims. In 1952 as in 1932 more of the junior high guides contained material that was specifically related to both future life's needs and children's needs. Likewise in both surveys junior high-school curriculum guides tended to emphasize the psychological approach and the senior high school guides tended to emphasize the logical approach.

In 1952 more guides included material organized on a unit plan than in 1932. However, the emphasis was on topics in the course. In both surveys few guides contained specific materials for reteaching or remedial instruction. There was little evidence of objective studies for the selection and organization of materials. In only a few instances were there suggestions for selecting local materials.

INDIVIDUAL DIFFERENCES

Not more than two-thirds of the curriculum guides contained material on individual differences. The suggestions that were included usually emphasized supplementary activities familiar to the pupil, the purpose of which was the mastery of a specific skill. From 1932 to 1952 there was little gain in the number of curriculum guides that included specific materials for individual differences, for ability groups, and for the laboratory plan. Seldom did the curriculum guides contain specific suggestions for either identifying or providing for the rapid learner or slow learner.

TEACHING PROCEDURES

More of the State curriculum guides in the survey of 1952 than in 1932 contained material on the following teaching procedures: methods related to the basic textual material, references to additional subject matter, correlation of mathematics with other subjects, and suggestions as to the use of corrective and practice material. More than three-fourths of the curriculum guides contained teaching procedures directly related to the basic textual material. This is considerably greater than in the survey of 1932. (See table 12.) Although there was an increase in the percentage of guides that contained suggestions for the correlation of mathematics with other subjects, less than one-third of the current guides contained such information.

There was little change during the last 20 years in the percentage of curriculum guides that provided information on visual aids for the teaching of mathematics and suggestions for pupil use of study material. About one-third of the guides in both surveys contained ways for pupils to use the study material. Approximately two-thirds of the junior high school guides and one-half of the senior high school guides in both 1932 and 1952 had procedures for using visual aids in mathematics. There were fewer junior high school guides in 1952 than in 1932 that included detailed procedures with the outline of specific materials, but the number of guides that contained general procedures applicable to the entire course had been increased. The opposite was true for the senior high school curriculum guides. The percentage of guides in this survey which contained illustrative and type lessons, suggestions as to topics of local interest, and references to methods of teaching was less than in the survey of 1932.

MEASURING THE LEARNING PRODUCT

Suggestions for testing mathematical outcomes whether they be skills or attitudes were in fewer State curriculum guides in 1952 than in 1932. Only two of the State curriculum guides contained standards for classification and promotion. These standards, which were for the junior high school, were in very general terms. In fact, in the 1952 survey even a detailed statement of outcomes was found in less than one-third of the guides for either the junior high school or senior high school. This is in harmony with the philosophy of placing the responsibility for standards upon the local school or individual teacher which has possibly been pressed too far. While prescriptive standards may discourage teacher initiative, suggestive goals and methods of measuring progress may be helpful to the inexperienced teacher. Since few guides in the present survey set forth standards for promotion, it is not surprising that there were no objective studies to support the standards presented. (See table 12.)

MECHANICAL MAKEUP

Few teaching guides in the survey of 1932 or 1952 paid attention to convenience of references, mechanical aids, or teacher revision. In fact, none of these characteristics was exhibited in half of the guides, and there was little change over the years.

Table 12.—Comparison of the number of State curriculum guides which exhibit certain characteristics in content and form in the surveys of 1932 and 1952

Characteristic	Curriculum guides							
	1932				1952			
	Junior high school (6)		Senior high school (10)		Junior high school (13)		Senior high school (10)	
	No.	%	No.	%	No.	%	No.	%
1	2	3	4	5	6	7	8	9
I. Objectives								
1. All secondary education	0	0	1	10	5	38	2	22
2. Junior high school or senior high school	0	0	0	0	4	31	1	11
3. Secondary mathematics	0	0	7	70	6	54	6	67
4. Junior or senior high school mathematics	5	83	0	0	9	69	3	33
5. Grade or course	0	0	5	50	8	61	8	89
6. Specific outcomes for each grade or course	2	33	5	50	5	38	7	78
7. Broad aims related to major objectives	1	16	0	0	7	54	7	78
8. Detailed aims related to broad aims	1	16	0	0	5	38	4	44
9. Influence of authoritative formulations	5	83	7	70	9	69	6	67
10. Influence of local conditions	0	0	0	0	2	15	1	11
II. Selection and organization of materials								
1. Materials specifically related to broad aims	2	33	0	0	6	64	4	44
2. Materials specifically related to detailed aims	2	33	4	40	9	69	6	67
3. Materials specifically related to future life needs	6	100	4	40	12	92	7	78
4. Materials specifically related to children's needs	6	100	2	20	10	77	2	22
5. Selection of local materials	1	16	1	10	3	23	1	11
6. Materials organized psychologically	6	100	2	20	9	69	1	11
7. Materials organized logically	6	0	9	90	3	23	8	89
8. Some materials chosen from other subject fields	6	100	2	20	9	69	1	11
9. Material organized on unit plan (other than textbook)	0	0	1	10	10	77	5	55
10. Relative emphasis on topics within course	5	83	5	50	9	69	9	100
11. Specific materials for reteaching, relearning	0	0	1	10	2	15	1	11
12. Suggestions as to articulation	3	50	6	60	5	38	3	33
13. Time allotments	1	16	4	40	2	15	3	33
14. Indication of use of objective studies	1	16	0	0	2	15	2	22
III. Individual differences								
1. Specific materials selected	0	0	2	20	1	8	1	11
2. Materials for ability groups	0	0	1	10	4	31	3	33
3. Suggestions as to use of laboratory plan	0	0	1	10	2	15	2	22
4. Suggestions as to directed study	3	50	2	20	3	23	1	1
5. Suggestive supplementary activities familiar to pupil	6	100	6	60	8	61	4	44
6. Activities distinct for knowledges, habits, attitudes, etc.	1	16	0	0	2	15	1	11
7. Connection of activities to mastery of specific objectives	4	66	3	30	7	54	5	55
8. Procedures suggestive for individual progress	2	33	2	20	6	46	3	33
9. Suggestions as to experimentation	0	0	2	20	2	15	1	11
10. Indication of use of objective studies	0	0	0	0	1	8	0	0

Table 12.—Comparison of the number of State curriculum guides which exhibit certain characteristics in content and form in the surveys of 1932 and 1952—Continued

Characteristic	Curriculum guides							
	1932				1952			
	Junior high school (6)		Senior high school (10)		Junior high school (13)		Senior high school (10)	
	No.	%	No.	%	No.	%	No.	%
1	2	3	4	5	6	7	8	9
IV. *Teaching procedures*								
1. General procedures applicable to entire course	4	66	10	100	10	77	5	55
2. Procedures connected with outline of specific materials	6	100	7	70	9	69	8	89
3. Illustrative and type lessons	3	50	3	30	5	38	2	22
4. Suggestions as to topics of local interest	5	83	5	50	3	23	2	22
5. Suggestions as to correlation with other subjects	1	16	1	10	4	31	2	22
6. Related to basic textual materials	1	16	5	50	11	85	7	78
7. Attention to attractive style of writing	1	16	1	10	5	38	3	33
8. Suggestions as to pupil use of study materials	2	33	3	30	5	38	2	22
9. Suggestions as to visual aids	4	66	5	50	6	64	5	55
10. Suggestions as to corrective and practice materials	2	33	3	30	6	64	2	22
11. References to additional subject matter	2	33	6	60	10	77	7	78
12. References to methods and theory of teaching	5	83	9	90	8	61	2	22
V. *Measuring the learning product*								
1. General standards for classification and promotion	0	0	2	20	2	15	0	0
2. Detailed statement of expected outcomes of learning	2	33	4	40	5	38	4	44
3. Suggestions for testing knowledges and skills	3	50	6	60	5	38	3	33
4. Suggestions for testing attitudes and appreciations	1	16	0	0	2	15	2	22
5. Use of objective studies in determining standards	0	0	0	0	0	0	0	0
VI. *Mechanical makeup*								
1. Attention to convenience of reference	2	33	2	20	2	15	4	44
2. Provision for teacher revision	0	0	0	0	1	8	0	0
3. Mechanical aids to emphasis	1	16	2	20	1	8	2	22

The table should be read as follows: (last item) Mechanical aids to using the guide were contained in one of the junior high school curriculum guides. This number is 16 percent of the total (6) junior high school guides.

NOTE.—Since these are independent items, the total of the percentages either vertically or horizontally should not necessarily be 100.

Methods of Developing Curriculum Material

THE CENTRAL OFFICE APPROACH

Teachers desire to improve their teaching and the administrators want to provide better educational experiences for boys and girls. The curriculum materials examined in this study reflect some of the efforts to improve the teaching of mathematics and these methods are quite varied. At one extreme is the authoritarian administrative approach. The curriculum material for mathematics is produced by a curriculum expert or a committee. The curriculum committee may be composed of a selected group of teachers of mathematics but in any case the material is produced at the top level for a State, county, or city and distributed to the schools. This method is based on the assumption that curriculum development should be initiated, managed, and at least supervised by persons in the central administrative office of the school system.

This approach was used more frequently in the 1920's, but it is still common today. It implies that curriculum change can best be done by having material prepared by specialists and distributed to teachers. When this procedure is used, the committee of curriculum specialists usually consists of teachers selected from different school levels, grades, or subjects throughout the school system. This committee may or may not secure the counsel of a curriculum specialist (usually a professor of education from a local teacher-training institution). The committee produces the material that all teachers are supposed to use. If the suggestions are followed, a degree of uniformity of instruction prevails for all children.

Some of the advantages of the authoritarian approach are:

1. Unity and standardization in achievement in mathematics.
2. Requires less time to develop written material where desirable.
3. Outstanding specialists in mathematics education produce the printed material.
4. Curriculum material may be developed without competent leadership at the local level.
5. The local administration does not need to assume the responsibility for promulgating new practices in the teaching of mathematics.

Some disadvantages are:

1. In many cases the teachers do not understand the curriculum material that is developed.
2. Teachers are inclined to resent the dictation from a central office. The approach, therefore, does not encourage cooperation.
3. The curriculum materials developed may not provide for the needs of a local community.
4. Little provision is made for the use of local resources in the mathematics education of the pupils.

5. Since the parents have not taken part in the planning, they may not be aware of the purposes of the educational activities. The result may be poor school-community relationships.

THE LOCAL APPROACH

At the other extreme in ways of developing curriculum material is the individual teacher or school approach. The curriculum development becomes the responsibility of the individual school and in many cases that of each individual teacher. Both the production and selection of curriculum material is left to the individual school. The central office of the State or city may know of some of the activities going on in the school, but the local school initiates, directs, and evaluates its program. This decentralized or grassroots approach is an outgrowth of the philosophy that curriculum development must be for actual pupils in actual communities by those who teach these children.

Some advantages of this individual school or local community approach in developing curriculum guides in mathematics are:

1. Better support for and understanding of the school by the local community.
2. Procedures and content more suitable for the child of that specific community may be developed.
3. Better cooperation of the teachers may be secured since it is their program.
4. The phase of curriculum development emphasized can be that phase of most interest to the teachers of the individual school.
5. The teachers may use more local resources.
6. Pupils may contribute to the curriculum development.
7. Easier communication of ideas.
8. Parents may contribute which may improve school-community relationships.
9. Deemphasizes strong central control of education.

Some of the disadvantages are:

1. Some teachers do not have the time or competency to develop curriculum material in mathematics.
2. Because of the pressure of other educational duties, schools may not choose to improve the curriculum. (For this reason it has been called the blank check and laissez-faire method.)
3. Schools may not be financially able to secure the consultants or publish the material.
4. The local school or community may lack leadership to initiate and direct a program of curriculum improvement.
5. Large school systems find the grassroots curriculum development procedure difficult to administer.
6. Administrators and local communities are reluctant to try practices that are new and different.
7. It does not provide for uniformity or standardization of education.

Someplace between these two extremes seems to be the goal of many leaders in the teaching of mathematics. A central office can do much to stimulate and encourage curriculum development in mathematics. Com-

sultative services, summaries of curriculum research, promising curriculum materials developed by other groups, evaluative material, and coordination with other programs may be provided by the central administration. The formulation of the objectives and procedures for realizing them will fall in large measure on the local school unit. Selected groups of teachers representing several schools and grade levels may make committee suggestions on objectives, procedures, and content that seem to be desirable for all children, but the local school unit must formulate the actual school program in terms of the local conditions.

When teachers of mathematics are taking part in a curriculum development program, it is important that they understand the type of approach favored by the administration. If the philosophy of the administration leans toward the authoritative approach, the material produced will be more formal and definite. If new procedures are suggested, they need to be quite clear since the teachers have had no part in the background discussions. Evaluational procedures can be set forth in more detail since relative uniform achievement will be expected.

If the administration favors an individual school or teacher approach, the material may be suggestive and not prescriptive. In fact, the curriculum guide may be for the use of only those persons who are developing it. In such a case, the guide may contain resource units and reminders of agreements and conclusions of the group. The evaluation material may consist of suggestions and examples of attempts to measure various types of educational growth.

In either curriculum approach, it would seem that the importance of the guide lies in its value to the classroom teacher in teaching boys and girls. Criteria for selecting curriculum material might well be: Will this material help an individual teacher provide a better educational experience in mathematics for the pupil? To be more specific, will it help Miss Jones in teaching Johnny? Would it have helped me the first years I taught? Such simple criteria may result in specific, concrete suggestions rather than nebulous theoretical discussions beyond the experiences of many classroom teachers.

OBJECTIVES

Perhaps those who are faced with the task of preparing curriculum material on the objectives of mathematics will recall that the objectives that have been of most value in teaching are not those comprehensive indefinite objectives stated in vague educational terminology but specific values that were translated into classroom action. When a teacher has 40 pupils in an algebra class, she is confronted with such specific questions as: How can the multiplication of a negative number by a negative number be explained so that it will make sense to each pupil? The objectives for algebra are of value only as they affect the learning experiences of the pupil. Many curriculum guides in this study contained lists of objectives,

although desirable, in such general terms that they were likely to affect very little the actual practices in the classroom. For example, some courses of study contained such worthy objectives for the teaching of mathematics as "To develop power of understanding," "To gain insight into mathematics," and "To think critically." It is doubtful if such general objectives will affect the teaching in a classroom. Perhaps the objective should be definite, about a mathematical concept vital in the education of the pupil, and one which it is possible to accomplish through mathematics instruction.

It was observed that in those teaching guides that contained concise and definite aims, the procedures and content usually reflected these aims. Likewise the general aims, such as "to think logically" were followed by hazy suggestions for obtaining them. After the selection of each aim, perhaps the procedure for realizing it should be definitely outlined.

In selecting mathematical aims, it might be helpful to observe that the objectives for the teaching of mathematics in the guides of this survey fell in at least three categories, namely, skills, attitudes, and understandings. Of course, these divisions are not mutually exclusive. For example, attitudes and understandings may be concomitant with learning a skill.

The more recent guides seem to emphasize understanding as a basis for learning skills. The following objectives selected from the courses of study are illustrative: "To interpret meaning of graphs in order to read intelligently the newspapers and magazines," "understand and interpret percentage so one can solve everyday problems involving percentage," and "an understanding of negative numbers with skill in using them in the four fundamental operations." Many guides stressed understanding in the objectives although in many cases ways of implementing these objectives were obscure. The following objectives illustrate the emphasis on understanding:

1. To gain clearer understanding of numbers.
2. To understand algebraic properties of proportion and algebraic transformation which one can apply and expand in later study of similar polygons.
3. To understand the need for financial planning and how to prepare a family budget.
4. To understand the merits of various kinds of investments.
5. To understand the meaning and importance of insurance.
6. To understand the meaning and importance of taxes and their use.
7. To understand the notation for integers, decimals, and fractions.

The development of desirable attitudes in mathematics is stressed by such objectives as:

1. To appreciate the importance of scale drawing in business and aviation.
2. To appreciate the value of graphs and charts in our everyday reading.
3. To appreciate the importance of signed numbers.
4. To develop an appreciation of deductive proof and ability to use this method.

5. To develop an appreciation of world's dependence upon mathematics—other sciences have progressed largely because of progress in mathematics.
6. To develop an awareness of geometry in our environment, in nature, art, and industry.
7. To appreciate accuracy in measurement when interpreting a scale drawing.
8. To appreciate the relationship that exists between algebra and geometry.

In harmony with the suggestions from many leaders in mathematics education that mathematics should provide an opportunity for a pupil to collect, organize, and interpret data and express a generalization in the language of mathematics many guides contain such objectives as the following:

1. To translate English into algebraic symbols.
2. To translate algebraic expressions into action.
3. To understand better the scientific method of problem-solving.
4. To gather, organize, and represent data in terms of mathematics.
5. To collect data and represent it by scale drawings.
6. To see the dependence of one quantity upon another (in an experiment) and express the relationship in a formula.

These objectives imply an inductive approach to a deductive science. Also they suggest that a mathematics laboratory might be helpful for teaching mathematics. In fact, some writers on the subject have advocated that every mathematics classroom should be a laboratory. However, a recent survey [4] disclosed that a mathematics laboratory was seldom used.

PROCEDURE AND CONTENT

If the procedures and content in a curriculum guide are to be most helpful to a teacher, it should be more than just a bare list of topics. The topic "formulas" in a curriculum guide is of little help to a teacher of mathematics. However, types of formulas that should be taught with examples of specific activities for teaching them might be very helpful to a teacher. Such examples do occasionally appear in the curriculum guides and more frequently in the professional magazines and yearbooks. A fruitful source is the experience of the local teaching staff. The activities suggested by the staff are more apt to make use of the resources of the local community.

In the curriculum guides in this survey the content for algebra, plane geometry, solid geometry, advanced algebra, and trigonometry did not vary from guide to guide. This was not the case in general mathematics, especially for the ninth grade. In some guides, general mathematics was a correlation of elementary algebra, informal geometry, and numerical trigonometry, while in other guides it was primarily consumer arithmetic with the inclusion of some simple formulas. There was evidence in the

[4] Brown, Kenneth E., Mathematics in Public High Schools. Washington, U. S. Government Printing Office, 1953. (Office of Education, Bulletin 1953, No. 5.)

curriculum guides of a great deal of activity by teachers of mathematics in developing and organizing the mathematics courses for general education. Such courses are frequently called general mathematics, but they may also be referred to as functional mathematics, basic mathematics, consumer mathematics, etc. As a result of a series of basic skills conferences in New York, a pamphlet, "Mathematics for All American Youth," was published. More than one thousand teachers took part in these conferences where some general recommendations were made on the mathematics that should be included in a general education program. More specific suggestions were made by a group of Florida teachers in a publication, "Functional Mathematics." The State Department of Education and the University of Florida sponsored summer workshops in which this latter publication was developed. These projects are examples of the many attempts to improve the mathematical offerings for the nonspecialist in mathematics.

EVALUATION

Methods of measuring the progress toward mathematics goals and suggestions for further improvement are included in a helpful curriculum guide. The evaluation material may include lists of standardized tests and what they attempt to measure, suggestions for teacher-made tests, observational procedures for measuring progress toward the hard to test for objectives, and suggestions for parent and other community evaluations. Hints for continued curriculum improvement and experimentation would be helpful. Although a review of curriculum guides of neighboring school systems and professional literature will yield many objectives, procedures, and evaluative techniques that are desirable, another source which is usually more convenient is the teachers within the school system. Many times the simple suggestion from a local teacher is more applicable than an elaborate proposal from the expert in a neighboring State.

Below is a checklist that may be helpful to the mathematics teacher in developing curriculum material. The items in this checklist are some of the more promising practices from current curriculum guides.

CHECKLIST FOR DEVELOPING CURRICULUM MATERIALS IN MATHEMATICS

Check the degree to which the following characteristics are exhibited in the curriculum guide.

Characteristics	*None*	*Some*	*Much*
1. Objectives stated in simple concise terms.....	____	____	____
2. Objectives give evidence of the study of other curriculum guides.....	____	____	____
3. Objectives provide for local needs and conditions.....	____	____	____
4. Objectives are in terms of actual expected achievement.	____	____	____

Characteristics	None	Some	Much
5. Objectives indicate continuous growth in mathematics is expected			
6. Objectives show evidence of a consideration for the psychological development of pupils			
7. The opinions of all those concerned with the pupils, including the parents, have been considered in arriving at the objectives			
8. The objectives in the guide are in harmony with general objectives of the school			
9. Procedures are directly related to the objectives			
10. Detailed descriptions are given of procedures for realizing objectives that are uncommon or especially difficult to achieve			
11. Procedures are suggestive and not prescriptive			
12. Procedures are suggested for both the slow and rapid learner			
13. Small group projects are suggested			
14. Ways for pupil participation are indicated			
15. Procedures include the use of the resources in the local community			
16. Procedures emphasize the laboratory approach			
17. Suggestions for teacher-pupil planning are included			
18. Examples of meaningful applications of mathematics within the experiences of the pupils are given			
19. Activities suggested are geared to the needs, interests, and maturity level of the pupils			
20. Activities are planned, managed, and evaluated cooperatively by pupils and their teachers			
21. The content is directly related to the objectives			
22. The content is suggestive and not prescriptive			
23. The content is mathematically important for boys and girls			
24. The content can be made meaningful to the pupils			
25. The content will help the boys and girls see the value and importance of mathematics			
26. Content is suggested for both the rapid and slow learner			
27. Content is suggested for pupils with different interests			
28. Multisensory aids are suggested			
29. The content includes the subject matter necessary for general education			
30. Content provides for continuous mathematical growth			
31. Evaluation is suggested in terms of the objectives			
32. Different methods of evaluation are emphasized (for example, standardized tests, teacher-made tests, observational procedures, community opinions, pupil self-evaluation, class or group evaluation)			
33. Evaluation is proposed in terms of the pupil's ability to learn			
34. Emphasis is on the change in the pupil rather than content learned			

Characteristics	None	Some	Much
35. The guide provides for and encourages continuous curriculum improvement.....	____	____	____
36. Teaching personnel from all subject areas and grade levels have contributed to the guide.....	____	____	____
37. Pupils have contributed to the development of the guide.....	____	____	____
38. All types of persons (administrators, teachers, and parents) who are concerned with the education of the pupil have contributed to the guide.....	____	____	____

Appendix

STATE CURRICULUM GUIDES IN SECONDARY SCHOOL MATHEMATICS USED IN THIS STUDY

ALABAMA—

Course of Study and Guide for Teachers, State Board of Education, grades 1–12, 1950, bound, printed, 459 p.

General course of study with section on mathematics.

DISTRICT OF COLUMBIA—

Curriculum Revision Program Mathematics. A Handbook and Guide for Teachers with Goals for Kindergarten Through Twelfth Grade, grades K–12, 1945, bound, printed, 75 p.

Teaching suggestions for evaluation, drill, and presentation of arithmetic processes. Goals outlined for mathematics education.

Mathematics Course of Study for Junior High School, Public Schools of the District of Columbia, grades 7–9, 1946, bound, printed, 198 p.

Goals, teaching suggestions, and references presented in parallel columns; appendix contains mathematics skits, plays, songs, and bibliography.

Mathematics Course of Study for Senior High School, Public Schools of the District of Columbia, grades 10–12, 1946, bound, printed, 234 p.

Content, method, and references presented in parallel columns; appendix contains analysis of mathematics needs of pupils and bibliography.

FLORIDA—

A Brief Guide to Teaching Mathematics in the Secondary Schools, State Department of Education, grades 7–12, 1946, bound, printed, 60 p.

Contains a section on improving mathematical instruction with emphasis on classroom aids.

Functional Mathematics in the Secondary Schools, State Department of Education, grades 7–12, 1950, bound, printed, 117 p.

Mathematics for general education, outlines, concepts, teaching procedures, and references in three parallel columns.

INDIANA—

Course of Study in Mathematics for Junior and Senior High Schools, State Department of Public Instruction, grades 9–12, 1950, bound, printed, 43 p.

Teaching suggestions with outline of minimum content. Recommends sequence for a two-track plan.

IOWA—

Mathematics Series, Junior High School, State Department of Public Instruction, grades 7–9, 1950, bound, printed, 116 p.

Includes material on evaluation, references, and lists of audio-visual aids.

Mathematics Series, Senior High School, State Department of Public Instruction, grades 10–12, 1949, bound, printed, 138 p.

Includes content outline of consumer mathematics for twelfth grade. Suggested pupil activities for each unit.

MASSACHUSETTS—

A Course of Study in Mathematics for the Junior High School Grades. Department of Education, grades 7–9, 1926, bound, printed, 32 p.

Divided into three parts: aims, material, and methods.

MINNESOTA—

A Guide for Instruction in Mathematics, State Department of Education, grades 7–12, 1953, bound, printed, 296 p.

Contains a section on use and development of units, use of devices and activities, source materials, and directory of published materials for teachers.

NEBRASKA—

Developing Mathematical Literacy in Nebraska, Workshop Seminar at Teachers College, University of Nebraska, grades 9–12, stapled, mimeo., 46 p.

Prepared by workshop seminar at the University of Nebraska. Contains many activities and procedures for a 2-year course in general mathematics. Many references included.

NEVADA—

High School Course of Study—Health, Physical Education, Mathematics, and Science, State Department of Education, grades 9–12, 1934, bound, printed, 68 p.

Standards of achievements given for each subject. Provision for teacher notes.

NEW MEXICO—

Mathematics, Tentative Guides for High School Teachers, State Board of Education, grades 9–12, 1944, bound, printed, 58 p.

Outline of content material with suggestions for correlation with other subjects.

NEW YORK—

Junior High School Mathematics, State Education Department, grades 7–9, 1949, stapled, mimeo., 47 p.

A topical outline with teaching suggestions and time schedule.

Mathematics for All High School Youth, State Education Department, grades 7–12, bound, printed, 108 p.

Report of 10 conference-clinics held in the State on basic skills; Appendix contains bibliography and list of films.

Tenth Year Mathematics, State Department of Education, 1951, stapled, mimeo., 30 p.

Content outline in experimental form with teaching suggestions and time schedule.

Eleventh Year Mathematics (Tentative), State Department of Education, grade 11, 1949, stapled, mimeo., 20 p.

Syllabus in Plane Geometry, State Department of Education, grade 10, 1949, stapled, printed, 15 p.

Syllabus in Advanced Algebra, State Department of Education, grade 12, 1949, stapled, printed, 14 p.

Syllabus in Intermediate Algebra, State Department of Education, grade 11, 1949, stapled, printed, 14 p.

Syllabus in Trigonometry, State Department of Education, grade 12, 1950, stapled, printed, 12 p.

Tentative Syllabus in Solid Geometry, State Department of Education, grade 12, 1950, stapled, printed, 18 p.

NORTH CAROLINA—

Mathematics in the Public Schools, State Department of Public Instruction, grades 1–12, 1950, bound, printed, 69 p.

Prepared by primary, grammar grade, and high school teachers. Illustrations used are actual classroom situations. Part II is devoted to secondary school; general content outline includes basic mathematics for eleventh or twelfth year.

NORTH DAKOTA—

Courses of Study for North Dakota High School Mathematics, Department of Public Instruction, grades 9–12, 1946, bound, printed, 67 p.

Content outline with time schedule.

OKLAHOMA—

A Suggested Guide for the Teaching of Mathematics, State Department of Education, grades 7–12, 1949, bound, printed, 61 p.

Prepared by teachers in a workshop; content and method combined in outline. Alternate outlines given for general mathematics. Bibliography.

PENNSYLVANIA—

A Course of Study in Mathematics for Secondary Schools, Department of Public Instruction, 1952, bound, printed, 295 p.

Chapters on bases for curriculum improvement, improving instruction, and evaluation are included. Appendix contains results of inquiry on needs of youth, some vocations which need mathematics and sample resource unit on financial security education.

VERMONT—

Suggested Courses of Study and Teacher's Manual in Mathematics for Vermont Secondary Schools, State Department of Education, grades 9–12, 1942, bound, printed, 53 p.

Contains illustrative units.

VIRGINIA—

Suggestions for the Inauguration of a Twelve-Year School System; Section V: Mathematics, State Board of Education, grade 8, 1947, stapled, mimeo., 21 p.

Suggestions for changing from 11-year to a 12-year plan. Content and method suggested for tenth grade.

WASHINGTON—

Modern Applications in High School Mathematics, Department of Public Instruction, grades 9–12, 1943, stapled, printed, 12 p.

Contains elementary mathematical problems in aviation.

Temporary Guides for the Senior High School Curriculum; Mathematics; Department of Public Instruction, 1943, looseleaf, printed, 23 p.

Illustrative unit in tool given. Suggested content for refresher arithmetic.

WEST VIRGINIA—

Tentative Program of Studies for Methods of Exact Thinking in Science and Mathematics, State Department of Education, grades 7–12, 1939, bound, printed, 127 p.

Gives methods for enrichment content.

Program for Grades Seven, Eight, and Nine Junior High and Elementary Schools, State Department of Education, 1946, bound, printed, 518 p.

General guide with section on mathematics. Lists activities containing mathematical concepts; contains suggestions for providing for individual differences.

LOCAL CURRICULUM GUIDES IN SECONDARY SCHOOL MATHEMATICS USED IN THIS STUDY

CALIFORNIA—

Burbank, *Outline Course of Study in Mathematics*, Burbank Unified School District, grades 7–12, 1949, bound, printed, 26 p.

Includes outline of general mathematics, exploratory mathematics, shop mathematics, and applied mathematics as well as traditional mathematics.

Los Angeles. *Handbook of Fundamentals*, Los Angeles City School Districts, grades 9–12, stapled, mimeo., 56 p.

Contains problems and exercises in arithmetic for use in the experimental mathematics program for college preparatory students.

Los Angeles. *Logarithms for Mathematics IV*, Los Angeles City School Districts, grades 11–12, 1949, stapled, mimeo., 26 p.

Contains exercises with many completely solved.

Los Angeles. *Graphs and Statistics for Experimental Mathematics*, Los Angeles City School Districts, grades 9–12, 1949, stapled, mimeo., 21 p.

A Comparative Statement of the Objective of the Experimental College-Preparatory Mathematics Program and the Regular Algebra, Geometry, and Trigonometry Courses, Los Angeles City School Districts, grades 9–12, 1949, stapled, mimeo., 8 p.

Consumer Problems (Experimental Use Only), Los Angeles City School Districts, grades 9–12, 1949, stapled, mimeo., 41 p.

Experimental Mathematics Program for College-Preparatory Students, Los Angeles City School Districts, grades 9–12, 1947, stapled, mimeo., 7 p.

Revised Outline Course of Study for Experimental Mathematics Program for College Preparatory Students, Los Angeles City School Districts, grades 9–12, 1949, stapled, mimeo., 21 p.

Outline Course of Study (Tentative) Basic Mathematics Senior High School, Los Angeles City School Districts, grades 9–12, 1948, stapled, mimeo., 17 p.

Academic Mathematics—Outline Course of Study for Junior and Senior High Schools, Los Angeles City School Districts, grades 9–12, 1947, stapled, mimeo., 15 p.

Experimental content outlines with specific page references to textbooks, except consumer problems, graphs, and statistics. Contains problems with suggestions for teaching them.

Los Angeles. *Outline Course of Study in Mathematics—Junior High School*, Los Angeles City Schools, grades 7–9, 1946, bound, printed, 42 p.

Solution of typical problems are given to indicate form, content, and procedure.

San Diego. *Mathematics Section, Section Curriculum Guide*, San Diego City Schools, grades 9–12, 1952, stapled, mimeo., 10 p.

Proposed Revision of Mathematics Curriculum, San Diego City Schools, grades 9–12, 1952, stapled, mimeo., 42 p.

Guide for Experimental Program in Mathematics A–B, 100–200, and 300–400, San Diego City Schools, 1952, stapled, mimeo.

A 3-track plan in mathematics beginning with the ninth grade.

San Francisco. *Teaching Guide in Mathematics, Kindergarten through Grade Nine*; San Francisco Public Schools, grades K–9, 1951, bound, printed, 220 p.

Contains section on evaluation, activities involving quantitative thinking.

COLORADO—

Denver. *The Mathematics Program of the Denver Public Schools* (Tentative), Denver Public Schools, grades K–12, 1951, bound, printed, 130 p.

Provision for the Teacher's notes. Vocabulary lists.

FLORIDA—

Miami. *Suggested Outlines for Algebra, Geometry, Trigonometry in Secondary Schools of Dade County*, Dade County Schools, grades 9–12, 1952, looseleaf, mimeo., 30 p.

Vocabulary lists. Time allotment for each unit.

Tampa. *Course of Study in Mathematics for Grades 7 through 9*, Hillsborough County Board of Public Instruction, grades 7–9, 1948, stapled, mimeo., 42 p.

Contains information on devices for checking answers.

Tampa. *Course of Study in Mathematics—Grades 10 through 12*, Hillsborough County Board of Public Instruction, grades 10–12, 1949, stapled, mimeo., 37 p.

Suggestions for evaluation. Sample tests in algebra.

GEORGIA—

Atlanta. *The Mathematics Program of the Atlanta Community High Schools*, 1950, bound, mimeo., Vol. I, 90 p.; Vol. II, 130 p.

Vol. I—Arithmetic, basic mathematics, and business mathematics. Content outlined with references to several books. Vol. II—Algebra, geometry, and trigonometry. Sample tests included.

KANSAS—

Kansas City. *Course of Study for Junior High School Mathematics*, Kansas City Public Schools, grade 9, 1952, stapled, mimeo., 36 p.

Contains vocabulary lists and bibliography.

ILLINOIS—

Waukegan. *Course of Study in Basic Mathematics*, Waukegan Township High School, grade 9, 1952, stapled, mimeo., 20 p.

A remedial course with emphasis on fundamentals of arithmetic.

Chicago. *A Course of Study in Algebra, Semesters I and II*—1943, 24 p.; *Essential Mathematics, Semester I*—1939, 92 p.; *Essential Mathematics, Semester II*—1939, 86 p.; *Essential Mathematics, Semester III*—1943, 65 p.; and *Essential Mathematics, Semester IV*—1943, 60 p.

A Tentative Course of Study in Plane Geometry, Semesters I and II, 1944, 13 p., Chicago Public Schools, stapled, mimeo.

Time allotment for small units. Unit tests.

IOWA—

Sioux City. *Tentative Course of Study in Mathematics*, Sioux City Public Schools, grades K–12, 1944, loose leaf, mimeo., 29 p.

Tentative content outline with provisions for revision.

MISSOURI—

Kansas City. *Course of Study for Junior High School Mathematics: Grade 7*—1952, 24 p.; *Grade 8*—1952, 27 p.; and *Grade 9*—1952, 36 p. *Course of Study for Senior High School Mathematics: Elementary Algebra*—1952, 46 p.; *Intermediate Algebra*—1952, 27 p.; *Plane Geometry*—1952, 30 p.; *Solid Geometry*—1952, 14 p.; and *Trigonometry*—1952, 27 p., looseleaf, mimeo.

Vocabulary lists. Suggestions for activities. Looseleaf and separate for easy revision.

LOUISIANA—

New Orleans. *Outline Course of Study in Mathematics*, New Orleans Public Schools, grades 9–12, 1949, stapled, mimeo., 12 p.

Definite content outline on character basis.

MARYLAND—

Towson. *A Tentative Course of Study in Junior High School Mathematics for Grade Seven*, 1946, looseleaf, mimeo., 44 p.

General objectives of junior high school as well as those for junior high school mathematics. Activities given for each unit.

Towson. *A Tentative Course of Study in Junior High School Mathematics for Grade 8*, Baltimore County Public Schools, 1946, looseleaf, mimeo., 60 p.

Chart presentation of 3-year sequence for the junior high school mathematics. Definite suggestions for evaluation. Sample tests.

Towson. *A Tentative Course of Study in Junior High School Mathematics for Grade 9*, Baltimore County Public Schools, 1947, looseleaf, mimeo., 85 p.

Objectives are separated into understandings, abilities and skills, and attitudes and appreciations.

Towson. *A Tentative Course of Study in Beginners' Algebra and Intermediate Algebra for the Senior High School*, Baltimore County Public Schools, grades 10–12, 1948, looseleaf, mimeo., 98 p.

Objectives of the senior high school are given in a chart.

Towson. *A Tentative Course of Study in Demonstrative Geometry for the Senior High School*, Baltimore County Public Schools, grade 10, 1949, looseleaf, mimeo., 60 p.

General objectives of education are included. Historical notes for each unit.

MASSACHUSETTS—

Somerville. *Course of Study in Mathematics for the Junior High School.* City of Somerville, Mass., School Committee, grades 7–9, 1938, looseleaf, mimeo., 65 p.

Solutions for many problems in each grade level given in detail as a part of the teaching procedure.

Somerville. *Course of Study in Mathematics*, City of Somerville, Mass., School Committee, grades 9–12, 1930, stapled, mimeo., 5 p.

Time allotment given for small units.

MICHIGAN—

Flint. *Consumer Mathematics in the Senior High School*, Flint Public Schools, grades 10–12, 1952, stapled, mimeo., 17 p.

Contains report of a study of the mathematical needs of former graduates.

MISSOURI—

St. Louis. *Mathematics Area, Course of Study Series*, The St. Louis Public Schools, grades 9–12, 1948, bound, mimeo., 50 p.

Contains suggestions for a 6-track system—3 years' general mathematics and traditional courses.

NEW JERSEY—

Westwood. *A Program of Mathematics for the Westwood Consolidated Schools*, grades K–12, 1951, looseleaf, mimeo., 57 p.

Contains a chapter on suggested learning experiences and methods.

Newark. *Mathematics Course of Study for High Schools*, Board of Education, grades 9–12, 1950, looseleaf, mimeo., 120 p.

Includes suggestions for social and consumer mathematics, analytical geometry, and the calculus. Bibliography for each subject.

NEW YORK—

Buffalo. *Algebra Unit for Eighth Grade*—1950, 3 p.; *Course of Study, Elementary Algebra*—1949, 8 p.; *Outline for Tenth Year Mathematics*—1951, 2 p. Board of Education, stapled, mimeo.

Parallel columns of content and suggested procedures.

New York City. *Course of Study and Syllabus in Mathematics, 7th, 8th, and 9th Years*, Board of Education of the City of New York, 1950, bound, printed, 68 p.

Desirable outcomes indicated in detail for each unit. Bibliography of books and pamphlets.

New York City. *General Mathematics for the Ninth Year*, Board of Education of the City of New York, 1950, bound, printed, 56 p.

Many suggestions on procedures in each unit. Mathematical recreations are included.

OHIO—

Akron. *Course of Study Outlines for Akron High School Mathematics*, Akron Public Schools, grades 9–12, 1945, bound, mimeo., 69 p.

Complete solution given to sample problems to indicate method of teaching.

Cincinnati. *Course of Study in Mathematics*, grades 9–12, 1950, bound, mimeo., 107 p.

Chapter on motivation. Suggestions for teaching each unit.

Youngstown. *Tentative Course of Study in Mathematics*, Youngstown Public Schools, grades 7–12, loose leaf, mimeo., 116 p.

Vocabulary lists, sample tests, and 2-track program for ninth and tenth grades.

OKLAHOMA—

Tulsa. *General Mathematics, A Course of Study for the Junior High School*, Tulsa Public Schools, grades 7–9, looseleaf, mimeo., 32 p.

Parallel columns giving basic content and enrichment.

PENNSYLVANIA—

Erie. *Fundamentals of Mathematics*—Grade 7, 1945. 32 p.; *Fundamentals of Mathematics*—Grade 8, 1945. 36 p.; *Mathematics I and II*—Grade 9, 1945. 24 p.; *Mathematics III and IV*—Grades 10, 11, and 12—1945, 30 p.; and *Algebra, Demonstrative Geometry, Trigonometry*—1946. 107 p., Grades 9–12, bound, mimeo.

Assignments suggested for three ability levels.

Philadelphia. *A Tentative Guide to Mathematics III and IV*, Curriculum Office, Philadelphia Public Schools, grade 10, 1952, stapled, mimeo., 50 p.

Part of a 3-year program for nonacademic students. Lists aids for teaching consumer mathematics; parallel columns giving content and suggested activities.

Philadelphia. *Tentative Guide to Mathematics III and IV*, Philadelphia Public Schools, grade 10, 1952, stapled, mimeo., 50 p.

Contains content and procedures for a course in general mathematics for the tenth grade. Emphasis on consumer mathematics.

Philadelphia. *Supplementary Information*, Philadelphia Public Schools, grade 10, 1952, stapled, mimeo., 30 p.

Suggested problems to accompany Guides III and IV.

Philadelphia. *A Guide to Mathematics*, Philadelphia Public Schools, grades 7–8, 1951, stapled, mimeo., 50 p.; *A Tentative Guide to Mathematics I, "The Worker,"* grade 9A, 1950, 15 p.; *A Tentative Guide to Mathematics II, "The Worker,"* grade 9B, 1950, 24 p.

Parallel columns giving content and activities.

Teaching Aids and Suggested Problems, 1950, 17 p., grades 7–9, stapled, mimeo. *Resource Materials and Suggested Problems*, grades 9–12, 1950, stapled, mimeo., 87 p.

Contains problems for consumer mathematics.

Scranton. *General Mathematics Course of Study*, Scranton Public Schools, grade 9, 1951, stapled, mimeo., 50 p.

Vocabulary lists are included, and problem analysis sample tests are given.

Scranton, *Algebra I, Course of Study*, Scranton Public Schools, grade 9, 1951, stapled, mimeo., 22 p.

Vocabulary lists are included.

SOUTH CAROLINA—

Columbia. *Mathematics Course of Study*, Junior and Senior High School, grades 9–12, 1951, stapled, mimeo., 24 p.

Content outline including general mathematics and traditional mathematics.

North Charleston. Course of Study in Mathematics, North Charleston High School, grades 8–12, 1952, stapled, typed, 5 p.

Emphasis on objectives.

SOUTH DAKOTA—

Rapid City. *7th Grade Arithmetic, 8th Grade Arithmetic, 9th Grade Algebra, 9th Grade General Mathematics, 10th Grade Plane Geometry, 11th Grade Advanced Algebra* (one semester), *11th Grade Advanced Algebra* (second semester), *12th Grade Solid Geometry, 12th Grade Trigonometry, 12th Grade Mathematics Refresher*, City Schools of South Dakota, 1952, stapled, typed, 2 p. each.

Brief tentative outline which can be readily revised.

TENNESSEE—

Nashville. *Tentative Guide, Grades One-Twelve*, Davidson County School System, grades 1–12, 1948, bound, printed, 26 p.

Includes lists of pupil activities for elementary grades.

TEXAS—

Dallas. *Mathematics in the Secondary School—A Guide for Teachers*, Highland Park Public Schools, grades 7–12, 1948, bound, mimeo., 78 p.

Sample exercises units given.

El Paso. *Course of Study for High School Mathematics*, The El Paso Public Schools, grades 9–12, 1949, bound, mimeo., 254 p.

Contains 6-week units; emphasis on procedures, based on a single textbook but references to additional textbooks. Suggestions for testing both knowledge and behavior.

Houston. *Junior High School Arithmetic*—1952, 6 p.; *Trigonometry*—1949, 3 p.; *Essentials of Arithmetic in Senior High School*—1951, 6 p.; *General Mathematics I and II*—1951, 10 p.; *Guide sheet for Solid Geometry*—1951, 1 p.; *Advanced Algebra*—1949, 6 p.; and *Algebra I–III*—1949, 6 p. Houston Public Schools, stapled, mimeo.

Tentative content outlines following specific text for each subject.

Levelland. *A Tentative Curriculum Guide for Mathematics*, Levelland Public Schools, grades 7–12, 1951, bound, mimeo., 170 p.

Evaluation separated into skills and learnings.

Waco. *Guide for Teaching: 7th Grade Arithmetic*—1949, 15 p.; *8th Grade Arithmetic* (first semester)—1949, 8 p.; *8th Grade Arithmetic* (second semester)—1950, 12 p.; and *General Mathematics*—1949, 9 p., stapled, mimeo.

References at end of each unit for teacher.

UTAH—

Salt Lake City. *A Guide for the Teaching of General Mathematics*, grade 9, 1950, bound, printed, 87 p.

Lists suggestions for evaluation and developmental activities at end of each unit.

VIRGINIA—

Richmond. John Marshall High School. *Algebra I*—9th grade—1952, 3 p.; *General Mathematics*—9th grade—1952, 2 p.; *Plane Geometry*—10th grade—1952, 3 p.; *Practical Mathematics*—10th grade—1952, 3 p.; *Algebra II*—11th grade—1952, 2 p.; *Plane Trigonometry*—12th grade—1952, 4 p.; *Solid Geometry*—12th grade—1952, 4 p.; and *Senior Arithmetic*—12th grade—1952, 2 p., stapled, mimeo.

Content outline for each subject in a 2-track plan.

WASHINGTON—

Seattle. *Mathematics—A Course of Study from K through 12*, Seattle Public Schools, grades 1–12, 1948, looseleaf, printed, 90 p.

Presents aims, methods, content, materials of instruction, and pupil achievements in parallel columns.

Tacoma. *Junior High School Mathematics Summary*, Tacoma Public Schools, grades 7–9, 1952, stapled, mimeo., 10 p.

Content outline by a committee of teachers.

WISCONSIN—

Milwaukee. *General Mathematics*, Milwaukee Public Schools, grades 9–10, 1949, stapled, mimeo., 40 p.

Suggested enriching materials and teaching procedures for each unit.

Milwaukee. *A Tentative Course in Twelfth Grade Arithmetic*, Milwaukee Public Schools, grade 12, 1947, stapled, mimeo., 22 p.

Contains sample units.